



DEQ-8 2017 Edition (Finally)

Bozeman, MT

May 2, 2018

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Montana Department of Environmental Quality

Major Changes

- * New Rules
- * Updated Circular
- * New Spreadsheets

- * Disclaimer: Everything in this presentation is based on proposed rules and proposed changes to the circular. Nothing is final and may change from what is presented here. I have limited ability to answer certain questions since rule-making is still in progress.

New Rules

New Rules – 17.36.310

- * Moves the design criteria for the “exempt plan” into the Circular (this is now the “Simplified Plan”)
- * Changes the criteria for when PE design is required:
 - * (a) six or more lots; or
 - * (b) a commercial lot or a lot proposed for use other than a single living unit, with greater than 25% impervious area.

New Rules – 17.36.310

- * Maintenance plans are now required for all storm water designs.
- * Clarifies when information from the floodplain administrator is required.
- * Get out of jail free card for subdivisions located entirely within a first-class or second-class municipality, as described in 7-1-4111, MCA, or within a Municipal Separate Storm Sewer System (MS4) general permit area.



ARM 17.36.310(5) Stormwater Certification
Sanitation in Subdivisions Act

Project Name: _____ EQ Number (if known): _____

Consultant/Engineer Name: _____

Applicant Name: _____

Please Select:

- First or Second-Class Municipality as defined in 7-1-4111, MCA*
Second-Class Municipality**
 - Havre
 - Anaconda
 - Miles City
 - Belgrade
 - Livingston
 - Laurel
 - Whitefish
 - Lewistown
 - Sidney
- Municipal Separate Storm Sewer System
 - MTR040001 – Billings
 - MTR040002 – Bozeman & MSU
 - MTR040003 – Helena
 - MTR040004 – Great Falls
 - MTR040005 – Kalispell
 - MTR040006 – Butte
 - MTR040007 – Missoula
 - MTR040008 – Malstrom AFB
 - MTR040009 – MDT Helena
 - MTR040010 – Yellowstone County
 - MTR040011 – Missoula County
 - MTR040012 – University of Montana
 - MTR040013 – Cascade County

Certification (to be completed by MS4 or municipality):

I hereby certify in accordance with ARM 17.36.310(5) that the above selected municipality or MS4 entity consents to an exemption from the Department of Environmental Quality requirements to submit a stormwater plan for the aforementioned subdivision. Further, the local standards and requirements with which the applicant must comply are no less stringent than the requirements of Montana Department of Environmental Quality Circular DEQ-8.

Name Signature Date

Title Organization

*Note: All First-Class Municipalities in Montana have an MS4 General Permit.
**Based on 2010 Census population data.



New Rules – 17.36.314

- * Change to the PE rules allowing for a re-issuance of an approval:

“If the original conditions of approval, applicable rules, and design standards have not changed since the department approved the system, the department shall reissue the approval to allow an additional three years to complete construction.”

Updated Circular

Updated Circular

- * Improved Layout:
 - * Table of Contents (interactive)
 - * List of Tables and Figures
 - * Bookmarked PDF for easier navigation
 - * [Link to Circular DEQ-8](#)

Updated Circular – Chapter 1

- * Applicability

- * Definitions

- * 1.2.11. Intensity-Duration-Frequency (IDF) Curve means a graphical representation of the relationship between rainfall or rainfall intensity and duration for different frequencies.
- * 1.2.19. Overtopping Roadways or Driveways means covering a road or driveway with storm water.
- * 1.2.21. Pre-treatment Facility means a structure that improves storm water quality by reducing sediment, trash, debris, or organic materials. The term does not apply to the pre-treatment standards promulgated by the EPA and set forth in 40 C.F.R. Part 403 and 40 C.F.R. chapter 1, subchapter N.

Updated Circular – Chapter 2

Submission of Plans

- * All applications **must** include a report – §2.2
- * All applications **must** include plans – §2.3
- * Construction documents **may** be required for complex designs – §2.4
- * All plans – standard or simplified – **must** have an O&M plan – §2.5
- * Deviation procedures – §2.6

Updated Circular – Chapter 3

Design Criteria

- * Simplified Plan – §3.2 – may be used only if all of the following criteria are satisfied:
 - A. The impervious area within each proposed lot has a slope of three percent or less;
 - B. Impervious areas comprise less than or equal to 25 percent of the total acreage of each lot; and
 - C. The proposed subdivision will not alter historic runoff patterns outside the boundaries of the lot.
- * Simplified Plans may not increase the volume of runoff between lots or adjoining property as a result of development during the 100-year storm event.

Updated Circular – Chapter 3

Design Criteria

- * Standard Plan – §3.3 – must demonstrate that the proposed subdivision will not allow storm water to do any of the following:
 - A. Exceed the pre-development runoff to an adjoining property during the 2-year storm event;
 - B. Overtop roadways or driveways during a 10-year storm event; or
 - C. Inundate any buildings or drain fields during a 100-year storm event. This may be demonstrated through either narrative descriptions or calculations.

Updated Circular – Chapter 3

Design Criteria

- * Initial Storm Water Facility – §3.4
- * Storm drainage designs must include an Initial Storm Water Facility sized to infiltrate, evapotranspire, and/or capture for reuse the post-development runoff generated from the first 0.5 inches of rainfall on impervious areas.

$$V = \frac{(0.5 * A_{imp})}{12 \frac{inches}{ft}}$$

Where:

V = minimum volume (ft³)

A_{imp} = total impervious area (ft²)

Updated Circular – Chapter 3

Design Criteria

- * Pre- and Post Development Conditions – §3.5
 - * Clarifies when the entire pre-development condition should be considered unimproved.
 - * Clarifies the procedure for rewrites.
 - * Clarifies situation where post-development impervious area is unknown.

Updated Circular – Chapter 3

Design Criteria

* Rainfall Intensity – §3.6

* Rainfall must be derived from the 24-hour storm duration and can be determined using the following sources:

A. Hydrometeorological Design Studies Center's Precipitation Frequency Data Server (NOAA Atlas 2), available online at <http://hdsc.nws.noaa.gov/hdsc/pfds/index.html>;

B. Data for select sites in accordance with Appendix A. For sites not represented in Appendix A, use the value from the closest reported station;

C. An IDF curve at the time of concentration; or

D. Other sources approved by the reviewing authority.

Updated Circular – Chapter 3

Design Criteria

- * Acceptable Methods– §3.7
 - * Appendix B
 - * “Other methods may be used upon approval by the reviewing authority.”

Updated Circular – Chapter 3

Design Criteria

- * Storm Water Volume – §3.8
 - * Pre- and Post-development conditions.
 - * Simplified Plan – based on the 100-year storm event.
 - * Standard Plan – based on the 2-year storm event.

Updated Circular – Chapter 3

Design Criteria

- * Peak Flow – §3.9
 - * Simplified Plan – may not alter historic runoff patterns outside the boundaries of the lot.
 - * Standard Plan
 - * Onsite Drainage Basin
 - * Pre-Development Peak Flow for the 2-year storm event
 - * Post-Development Peak Flow for the 2-year storm event
 - * Post-Development Peak Flow for the 10-year storm event
 - * Post-Development Peak Flow for the 100-year storm event
 - * Offsite Drainage
 - * Peak Flow for the 2-year storm event
 - * Peak Flow for the 10-year storm event
 - * Peak Flow for the 100-year storm event

Updated Circular – Chapter 4

Conveyance Structures

- * Clarifies that impacts from sediment deposition and erosion must be addressed.
- * Conveyance structures must be designed to convey post-development peak flow
 - * without overtopping roadways or driveways during a 10-year storm event and
 - * without inundating any buildings or drain fields during a 100-year storm event.

Updated Circular – Chapter 4

Conveyance Structures

- * Describes three common types of conveyance structures:
 - * Open Channels
 - * Storm Sewers
 - * Culverts
- * And the design criteria for each.

Updated Circular – Chapter 5

Retention and Detention Facilities

- * Includes criteria for sizing, location, design details, and safety issues (where applicable)
- * Includes the criteria that the facility will not
 - * overtop roadways or driveways during a 10-year storm event and
 - * inundate any buildings or drain fields during a 100-year storm event.

Updated Circular – Chapter 5

Retention and Detention Facilities

- * Retention facilities:

- * Must be sized for the difference between the pre- and post-development runoff volumes, with no consideration for infiltration or designed outlet and include the volume of the initial storm water facility.
- * Side slopes must be no steeper than 3 to 1 and must be stabilized.
- * Should not be designed to hold runoff for more than 72 hours.

Updated Circular – Chapter 5

Retention and Detention Facilities

* Detention facilities:

- * May not be used in simplified plans.
- * Must capture runoff and release it at a flow rate equal to or less than the pre-development peak flow rate for the 2-year storm event.
- * Capacity must include minimum volume requirement for an Initial Storm Water Facility as either infiltration or retention.
- * Should not be designed to hold runoff for more than 72 hours.
- * Engineered outlet must be designed to provide a stabilized transition from the facility and reduce erosive velocities.

Updated Circular – Chapter 6

Infiltration Facilities

- * Infiltration facilities:
 - * Capacity must include minimum volume requirement for an Initial Storm Water Facility as either infiltration or retention.
 - * Must be sized in accordance with Appendix C (infiltration rates and testing procedure).
 - * Should be sized to drain in 48 hours.
- * Lawns and landscaping areas proposed as infiltration facilities must be sized using the appropriate runoff coefficient, curve number, or other factor consistent with the proposed land use and as designated by the selected design method in accordance with Appendix B.

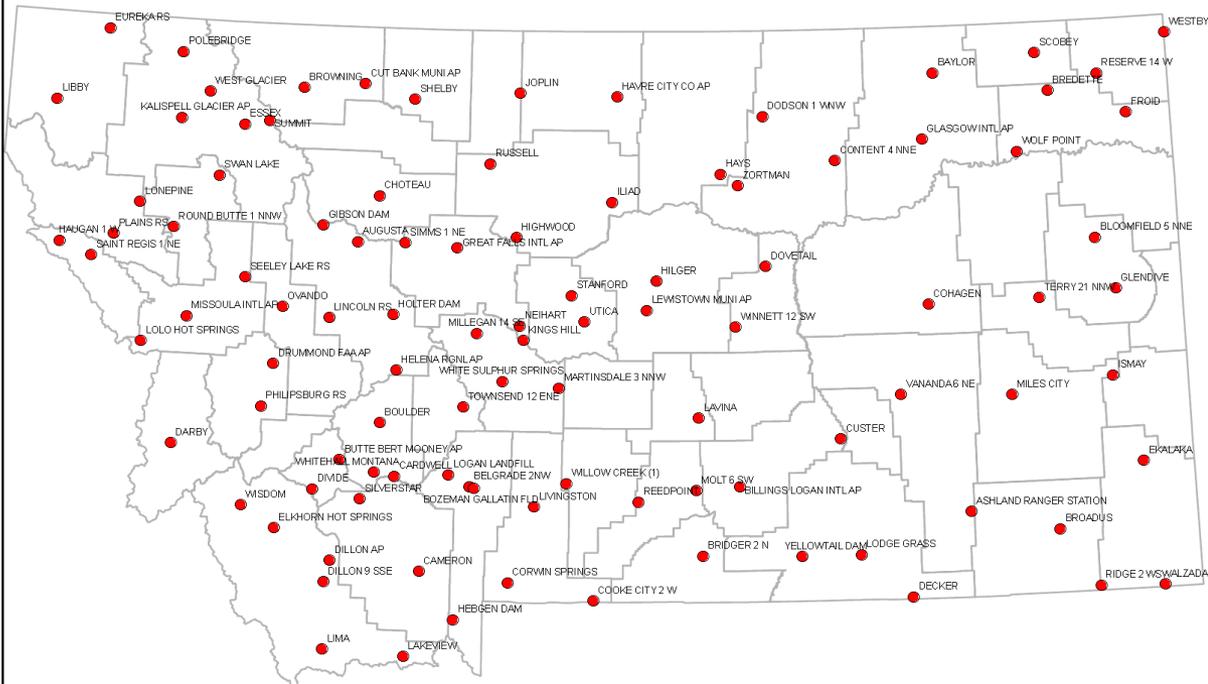
Updated Circular – Chapter 7

Pre-Treatment Facilities

- * “Only those facilities described in this Chapter may be used as pre-treatment facilities.”
- * Describes designs for
 - * Vegetative filter strips
 - * Vegetated swales
 - * Screens
 - * Oil/water separators
 - * Proprietary spinners/swirl chambers/centrifuges
 - * Drain inlet inserts

Updated Circular – Appendix A Rainfall Data

102 Stations Listed In DEQ 8



Legend

● Station and Number In Table

- * 2-year 24-hour
- * 10-year 24-hour
- * 100-year 24-hour

Updated Circular – Appendix B

Acceptable Hydrologic Models & T_c

- * Appendix B.1 – Methods
 - * Rational Method
 - * TR-55
 - * Storage-Indication Routing

Updated Circular – Appendix B

Acceptable Hydrologic Models & T_c

* Rational Method

1. paved or other hard surface areas — 0.90;
2. gravel areas — 0.80;
3. undeveloped areas — 0.20; or
4. lawns or other landscaped areas — 0.10.

Updated Circular – Appendix B

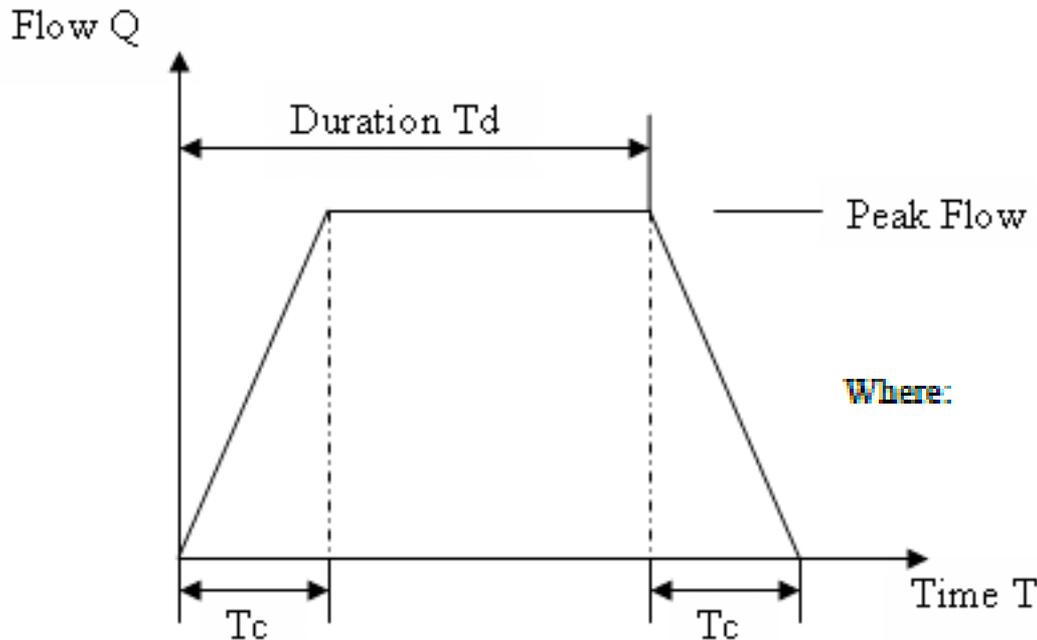
Acceptable Hydrologic Models & T_c

- * The intensity (i) must be determined using:
 1. tabulated rainfall data in Appendix A. This data is a conservative estimate of intensity and the value must be assumed to be in/hour or,
 2. Intensity-Duration-Frequency (IDF) curve developed for the location of the development for a time period equal to the time of concentration of the drainage basin. **The minimum time of concentration is 5 minutes.** For multiple sub-drainage areas, the longest time of concentration must be selected. IDF curves for selected areas are available from the Department.

Updated Circular – Appendix B

Acceptable Hydrologic Models & T_c

* Modified Rational Method



$$V = T_D * Q$$

Where:

V = Volume (cubic feet)

T_d = Storm Duration (minimum of 3600 seconds)

Q = peak flow rate (cfs)

Updated Circular – Appendix B

Acceptable Hydrologic Models & T_c

- * Appendix B.2 – Time of Concentration
 - * Includes equations
 - * Sheet Flow
 - * Shallow Flow
 - * Longest time of concentration must be selected if there are multiple drainage areas.

Updated Circular – Appendix B

Acceptable Hydrologic Models & T_c

* Appendix B.3 – Computer Models

- * Hydraflow extensions for AutoCad, HEC-1, WINTR-55, WINTR-20, and SWMM
- * When using computer models:
 - * A. The minimum time of concentration is 5 minutes.
 - * B. The rainfall intensity must be determined using an IDF curve for a time period equal to the time of concentration of the drainage basin.
 - * C. For multiple sub-drainage areas, the longest time of concentration, either individually or collectively, must be selected.
 - * D. Computations and assumptions for the model must be provided.
 - * E. Inflow-outflow hydrographs must be presented graphically.
 - * F. Schematic (node) diagrams must be provided for all routings.

Updated Circular – Appendix C Infiltration Testing Procedures

* Appendix C.1 – Design Infiltration Rate

Table 2. Infiltration Rates

Texture	Infiltration rate (inches per hour)
Gravel, gravelly sand, or very coarse sand (c)	2.6
Loamy sand, coarse sand (d)	1.05
Medium sand, sandy loam	0.9
Fine sandy loam, loam	0.7
Very fine sand, sandy clay loam, silt loam	0.7
Clay loam, silty clay loam	0.07
Sandy clay	0.07
Clays, silts, silty clays (e)	0.0

Updated Circular – Appendix C Infiltration Testing Procedures

- * Appendix C.2 – Encased Falling Head Test
- * Includes instructions on the procedure

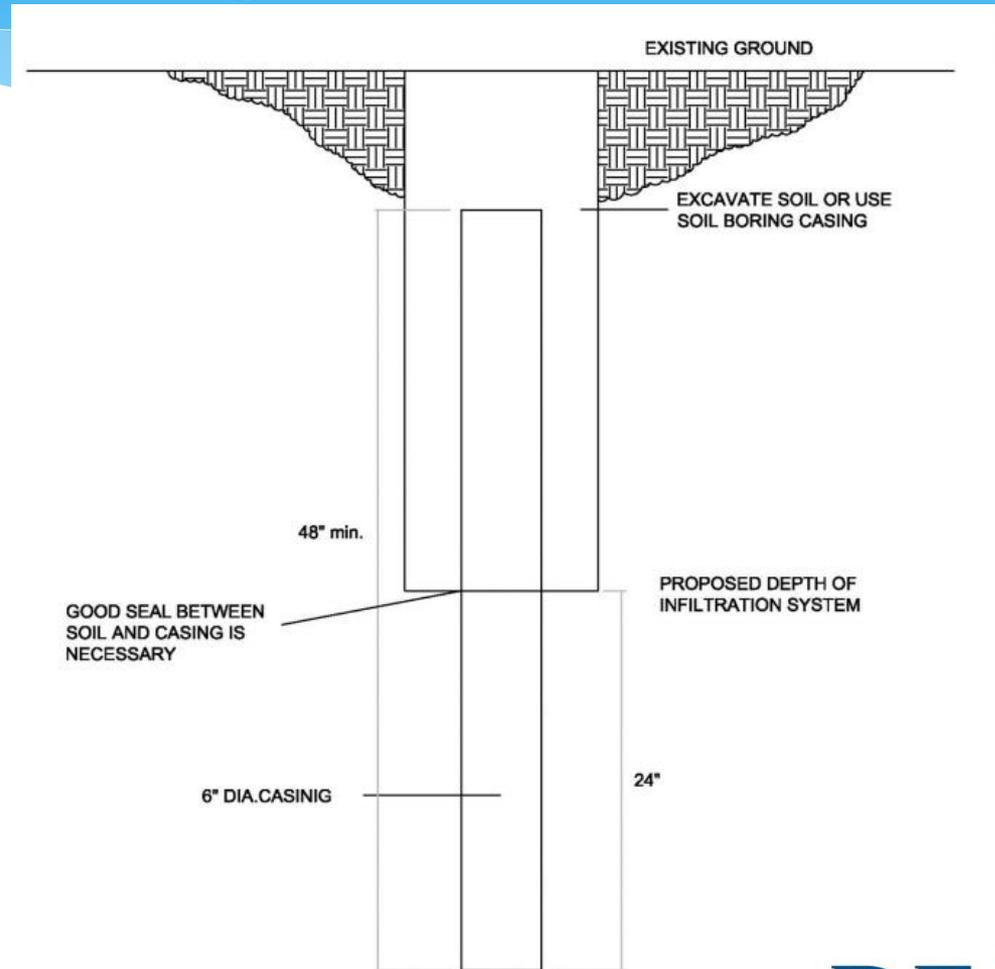


Figure 2. Encased Falling Head Schematic

Updated Circular – Appendix D & E Equations

- * Appendix D – Detention Outlet Structure Equations
 - * D.1 – Circular Orifices
 - * D.2 – Weirs
- * Appendix E – Conveyance Structure Equations
 - * E.1 – Chezy-Manning Formula
 - * E.2 – Curb and Gutter
 - * E.3 – Storm Sewer Velocities (table)

Updated Circular –

- * Appendices H through M include examples:
 - * Initial Storm Water Facility
 - * Simplified Plan
 - * Standard Plan – Retention Facility
 - * Standard Plan – Infiltration Facility
 - * Standard Plan – Detention Facility
 - * Standard Plan – Conveyance Facility

Updated Circular – Appendix N

APPENDIX N - SHALLOW CONCENTRATED FLOW

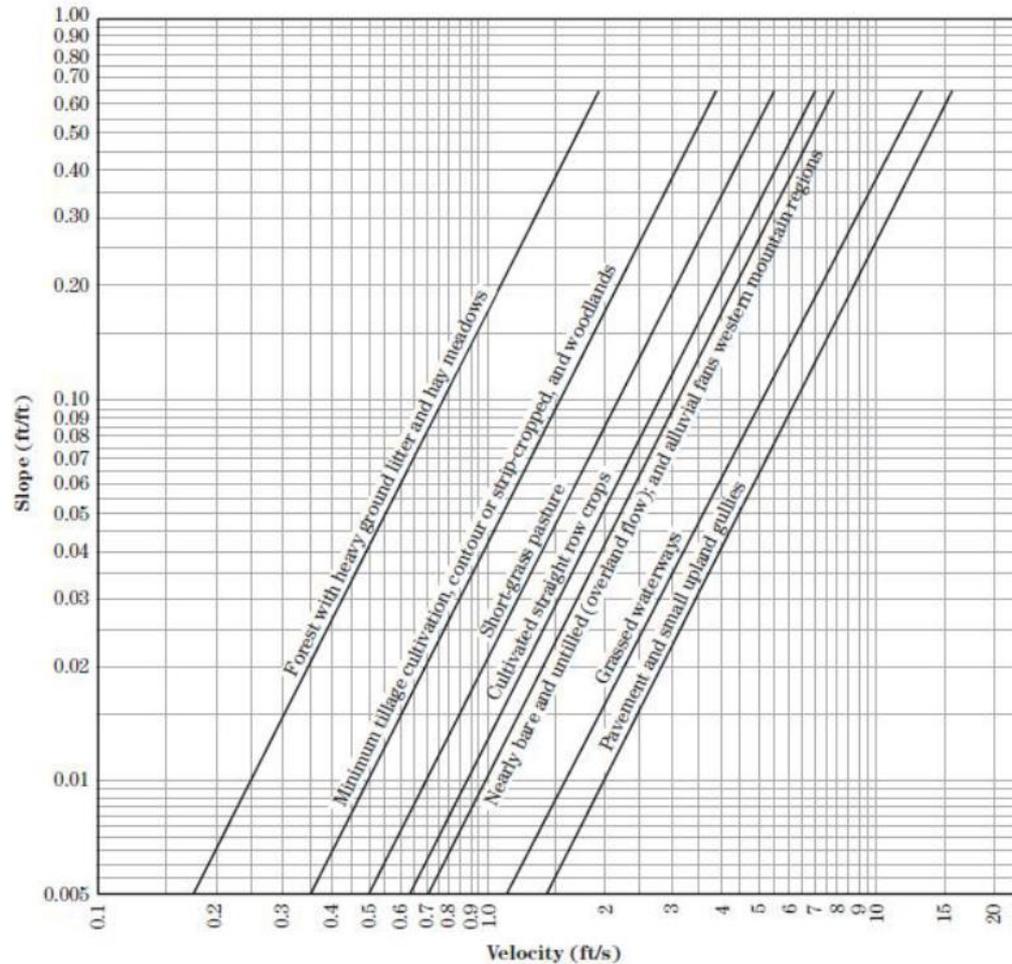


Figure 18. Shallow Concentrated Flow Slope and Velocity

Updated Circular – Appendix O

APPENDIX O - EXAMPLE DRAWINGS

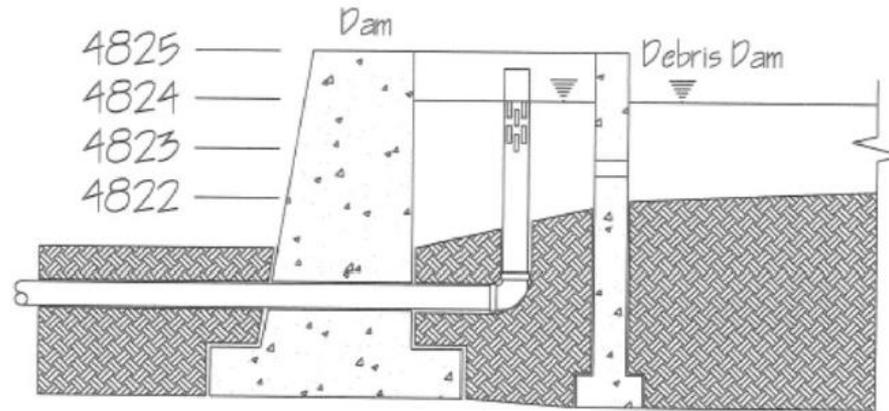


Figure 19. Slotted Riser Pipe Example

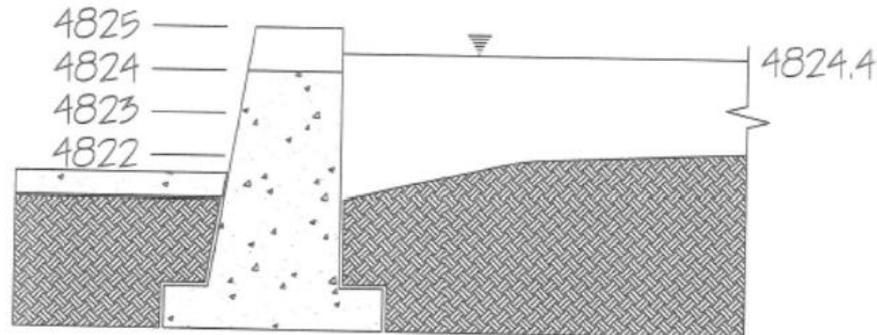


Figure 20. Rectangular Weir Example

New Spreadsheets!!!

APPENDIX F - SPREADSHEET – SIMPLIFIED PLAN

Appendix F: Simplified Storm Drainage Plan



Subdivision Name
 EQ#
 County
 Location
 Lot/Area No.
 Max. Slope on Lot % OK
 Impervious Surfaces % OK
 Will Alter Off-site Pass-Through? STOP, Submit a DEQ-8 Plan

Rational Method Co-Efficients (C)	
0.9	Paved/hard surfaces
0.8	Gravel surfaces
0.1	Lawn/landscaping
0.2	Unimproved areas

$Q=C*i*A$

100-year, 24-hour, i inches

Total Area/Lot Size acres = 0 ft²

Pre-Development Characteristics			100-year, 24-hour i (volume)
Paved/House Area	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Gravel Area	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Lawn/Landscaping	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Unimproved Area	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Total	0 acres	0 ft²	V_{Total}= 0.00 ft³

Post-Development Characteristics			100-year, 24-hour i (volume)
Paved/House Area	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Gravel Area	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Lawn/Landscaping	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Unimproved Area	0 acres	<input type="text"/> 0 ft ²	V= 0 ft ³
Total	0 acres	0 ft²	V_{Total}= 0.00 ft³

Increase in Runoff Volume (Minimum Retention Pond Size)	ΔV= 0.00 ft³
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= input field



APPENDIX G - SPREADSHEET – STANDARD PLAN

Appendix G: Standard Storm Drainage Plan



Subdivision Name
 EQ#
 County
 Location
 Lot/Area No.

Rational Method Co-Efficients	
0.9	Paved/hard surfaces
0.8	Gravel surfaces
0.1	Lawn/landscaping
0.2	Unimproved areas

$Q=C*i*A$

Intensity Values
 2-year, T_c inches/hour
 2-year, 24-hour inches
 10-year, T_c inches/hour
 100-year, T_c inches/hour
 100-year, 24-hour inches

Total Area/Lot Size acres = 0 ft²

Initial Stormwater Facility Volume (0.5" x Impervious Area) 0 ft³

Pre-Development Characteristics			2-year, T_c (flow rate)	2-year, 24-hour (volume)	10-year, T_c (flow rate)	100-year, T_c (flow rate)	100-year, 24-hour (volume)
Paved/House Area	0 acres	<input type="text"/> ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Gravel Area	0 acres	<input type="text"/> ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Lawn/Landscaping	0 acres	<input type="text"/> ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Unimproved Area	0 acres	0 ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Total	0 acres	0 ft ²	Q_{Total}= 0.000 ft³/sec	V_{Total}= 0.000 ft³	Q_{Total}= 0.000 ft³/sec	Q_{Total}= 0.000 ft³/sec	V_{Total}= 0.000 ft³

Post-Development Characteristics			2-year, T_c (flow rate)	2-year, 24-hour (volume)	10-year, T_c (flow rate)	100-year, T_c (flow rate)	100-year, 24-hour (volume)
Paved/House Area	0 acres	<input type="text"/> ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Gravel Area	0 acres	<input type="text"/> ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Lawn/Landscaping	0 acres	<input type="text"/> ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Unimproved Area	0 acres	0 ft ²	Q= 0.000 ft ³ /sec	V= 0.000 ft ³	Q= 0.000 ft ³ /sec	Q= 0.000 ft ³ /sec	V= 0.000 ft ³
Total	0 acres	0 ft ²	Q_{Total}= 0.000 ft³/sec	V_{Total}= 0.000 ft³	Q_{Total}= 0.000 ft³/sec	Q_{Total}= 0.000 ft³/sec	V_{Total}= 0.000 ft³

Runoff Flow/Volume Change	$\Delta Q= 0.000$ ft ³ /sec	$\Delta V= 0.000$ ft ³	$\Delta Q= 0.000$ ft ³ /sec	$\Delta Q= 0.000$ ft ³ /sec	$\Delta V= 0.000$ ft ³
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Required Minimum Facility Volume: 0 ft³

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New Spreadsheets

- * IDF Curve Spreadsheet
- * [Link to Subdivision Page](#)

Questions?

Akroon@mt.gov, 406-461-9844



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